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## 4.0 RESULTS AND DISCUSSION

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This section presents the results of the field sampling, laboratory analytical and waste management activities program conducted along the southern property boundary during the installation of the retaining wall.

### 4.1 AIR MONITORING AND SAMPLE ANALYTICAL RESULTS

Field PID/OVA readings ranged from 0 ppm to 3,600 ppm (caisson 19). Records of the PID/OVA readings are provided in Appendix A. Where elevated PID/OVA readings were encountered, mitigation measures such as covering soil stockpiles with plastic, placement of PAS in roll-off bins, and water application were instituted. A summary of the field monitoring and mitigation measures is provided in Table 1.

Gasoline range compounds and VOCs were not detected in the 4 ambient air samples collected in summa canisters, therefore no summary table has been prepared. Copies of laboratory analytical reports for air samples are provided in Appendix B.

### 4.2 SOIL SAMPLE LABORATORY ANALYTICAL RESULTS

The results of laboratory analyses performed on soil samples are presented in Table 2 and summarized below. Copies of laboratory analytical reports for soil samples are provided in Appendix B.

TPH (as gasoline) was detected in 5 of the 14 samples submitted for this analysis. Detected concentration ranged from 13 mg/kg to 630 mg/kg (RW-S3-8).

TRPH was detected in 6 of the 9 samples submitted for this analysis. Detected concentrations ranged from 14 mg/kg to 170 mg/kg (RW-S11-2).

TPH as motor oil was detected in 2 of the 8 samples submitted for this analysis. Concentrations ranged from 94 mg/kg to 200 mg/kg (RW-S11-2).

13 samples were analyzed for carbon chain identification (CCID) to help characterize the type of petroleum compounds in the soil. Where detected, the majority of hydrocarbons generally fell into 2 groups; the C<sub>7</sub> through C<sub>19</sub> range, and the C<sub>26</sub> and above range.

For the 2 samples that were submitted to the laboratory for a hydrocarbon forensic evaluation / weathering analysis (FF-1 and FF-2), the following observations were reported:

- A low boiling hydrocarbon product such as gasoline and/or naphtha, and a middle distillate such as diesel fuel were detected.



- The low boiling compound in FF-1 showed little evidence of highly volatile constituents or BTEX, indicating that the product may have undergone extensive degradation or that it is an intermediate refinery product.
- The low boiling compound in FF-2 showed some evidence of highly volatile constituents; however, the level is much less than expected of that of un-degraded gasoline.
- Both samples contained a medium boiling compound absent of n-alkanes, indicating that it has undergone biological degradation.

11 samples were analyzed for VOCs by gas chromatography/mass spectrometer (GC/MS). VOCs were detected in three samples. The reported compounds were methylated or butylated benzene compounds and naphthalene. Detected concentrations ranged from 1,500 ug/kg (1,3,5-Trimethylbenzene in sample RW-S3-8) to 31,000 ug/kg (naphthalene in sample RW-S3-8)

Only 1 of the 2 samples analyzed for pesticides contained detectable concentrations, 1.9 ug/kg of alpha-BHC was detected in sample RW-S4 at a depth of 8 feet bgs.

#### 4.3 WASTE MANAGEMENT

Selected drill cuttings (produced during caisson installation) with elevated PID/OVA readings were placed in covered roll-off bins. Results of laboratory analysis were used to characterize the PAS as non-hazardous waste. On March 17<sup>th</sup>, 2000 3 roll-off bins containing a total of approximately 40 cubic yards (yds<sup>3</sup>) of PAS were transported to TPS, Inc. (TPS) of Adelanto California. TPS thermally treated the PAS and recycled the material. Waste management activities conducted are summarized in Table 3. Copies of manifests and shipping papers are provided in Appendix C.

#### 4.4 DISCUSSION

The results of assessment activities have been grouped into several discussion topics presented below.

##### 4.4.1 Proximity of Fuel Hydrocarbons to Adjacent Pipelines

2 separate, areas of PAS were encountered along the southernmost boundary of the Former C-6 Facility within the pipeline easement. The inferred lateral extents of these areas are shown in Figure 4. The western PAS area is approximately 70 feet in length and was encountered while installing caisson 18 through caisson 22. The eastern PAS area is approximately 50 feet in length and was encountered while installing caisson 25 through caisson 29. The presence of numerous buried pipelines immediately north of the retaining wall and private property within a few feet to the south inhibited the ability to assess the lateral and vertical extent of the PAS areas.



Field observations combined with PID/OVA measurements and laboratory analysis indicate that low-boiling point fuel hydrocarbons are first encountered at depths ranging from 8 to 12 feet bgs. These depths are below the base of the buried products pipelines within the easement. To illustrate this correlation, cross-sections have been created. Cross section locations are provided in Figure 4. The West-East Cross Section A-A' (Figure 5) illustrates the occurrence of low boiling point fuel hydrocarbons at their highest detected concentrations (sample RW-S3-8 and sample RW-S3-11) below the base elevations of the pipelines. The North-South Cross Section B-B' (Figure 6) identifies each of the 11 pipelines within the easement.

#### 4.4.2 Correlation of Detected Hydrocarbons to Products Carried in Pipelines

Results of laboratory analysis indicate the 2 categories of hydrocarbons were detected in the pipeline easement area.

- *High boiling point hydrocarbons near the ground surface.* Samples RW-S10-2 and RW-S11-2 collected from 2 feet bgs contained TPH as motor oil at 94 mg/kg and 200 mg/kg respectively. No VOCs were detected in these samples. These results are consistent with historical samples collected during previous work conducted by Kennedy/Jenks Consultants, Inc. (KJI) in the southern portion of Parcel B (KJI, 1998). Historical sample 2BB-2-28 contained 62 mg/kg at 1 foot bgs. No TRPH was detected in the sample collected at 10 feet bgs. The location of this sample is presented in Figure 4. A possible source of the low boiling point hydrocarbons (TPH as motor oil) in the surface soils is a former railroad spur that ran parallel to the southern boundary of the property. The railroad spur was removed in 1998, and is believed to have been in operation for over 50 years. The use of motor (lubrication) oils in trains is extensive, and historical operations may have impacted shallow soils in the area.
- *Low boiling point hydrocarbons and VOCs at 8 to 12 feet bgs.* Samples RW-S3-8, RW-S3-11 contained elevated concentrations of TPH as gasoline. These samples also contained VOCs. Soil samples from both the western PAS area and the eastern PAS area were also analyzed by forensic hydrocarbon evaluation to qualitatively assess the nature and source of the hydrocarbons present. The forensic evaluation indicated that the low boiling point compounds present appeared to be from a refined petroleum product source that could include degraded gasoline and/or naphtha, or a middle distillate such as diesel fuel or intermediate-grade refinery product. These compounds are similar to the products transported in the pipelines within the easement. The pipelines are not owned or operated by Boeing or its predecessors.

#### 4.4.3 Nature and Status of Hydrocarbon Sources

A review of the information collected during the pipeline easement assessment indicates the following with respect to the nature and likely status of the sources for the hydrocarbons encountered:



- The high boiling point hydrocarbons encountered in the shallow soil may have been resultant from historical operations in the area. The low concentrations detected combined with their surficial nature do not point to a large concentrated release source. All Boeing operations in the area have ceased and no ongoing source is present.
- Forensic analysis of the low boiling point hydrocarbons reports they have been weathered and degraded, indicating a presence in the subsurface for some time with out "replenishment". Additionally, fuel hydrocarbon concentrations were below those that would indicate a nearby and continuing source. This likely points to a historical release(s) from the pipelines(s) as the source for the low boiling point fuel hydrocarbons encountered at depth.

#### 4.4.4 Comparison of Residual Chemicals to Established Cleanup Levels

IESI has developed "Health Based Remediation Goals" (HBRGs) for approximately 120 compounds at the Former C-6 Facility (IESI 1997). Concentrations of ethyl benzene and alpha-BHC were below their respective HBRGs of  $7.33\text{E}+05$  mg/kg and  $3.93\text{E}+00$  mg/kg

Concentrations of detected chemicals that do not have a corresponding HBRG were compared to EPA Region 9 Residential Preliminary Remedial Goals (PRGs) (USEPA, 2000). In all cases, detected concentrations of VOCs detected during this investigation were below the residential PRG. Selected HBRGs and PRGs are listed in Table 2.